P. Gratacap, C. S. Hastings, J. P. Iddings, C. L. Jackson, S. P. Johnson, S. C. Keith, N. T. Lawrence, G. Lefevre, C. K. Leith, E. W. McBride, L. B. Mendel, T. C. Mendenhall, A. A. Michelson, John Muir, E. W. Nelson, E. L. Nichols, A. E. Ortmann, Wm. Palmer, H. S. Pritchett, T. M. Prudden, H. A. Purdie, E. F. Smith, J. C. Smock, R. Thaxter, O. H. Tittmann, John Trowbridge, W. L. Underwood, Lester F. Ward, A. G. Webster, E. L. Wells, C. A. White, S. W. Williston, H. C. Wood and R. R. Wright. It was not practicable to apply a similar test to the foreign lists, and it may be that they are fuller.

To test the accuracy of the addresses given they were compared with lists, of approximately the same date, published by the Washington Academy of Sciences, the Geological Society of America, the American Society of Naturalists and the American Ornithologists Union, and with 400 other addresses taken at random from 'Who's Who in America' and the lists of the American Association and the affiliated societies of Washington. In all about 750 addresses were compared, and it was found that about ten per cent. of those given by the directory are erroneous. Similar comparison was made of 291 names common to the directory and the list of the Geological Society of London, with the result that 52 addresses were found to be discrepant, but in this case it was not possible to say how many were wrong.

Of deceased scientists so notable that their deaths are recorded in the necrologies of the National Academy, the *American Journal of Science*, or the American 'Who's Who,' no less than 49 are retained by the directory. Among these are not only Powell and Le Conte, already noted, but Elliott Coues, Horatio Hale, James Hall, J. Willard Gibbs, St. George Mivart, Henry Morton, A. E. Nordenskiold, H. A. Rowland and Rudolph Virchow.

The arrangement of the names is by countries, with a classification which has been gradually evolved through successive editions. Part I. comprises, first, the United States and Canada, and then, in order, Great Britain, Central America, South America, Oceanica and Africa. Central America is made to include not only the usual states, but Mexico, Newfoundland and the islands of the West Indies; and the countries of Asia are placed under Oceanica. Part II. includes all the countries of Europe except Great Britain. The use of Part II. is facilitated by having its parts arranged in alphabetic order, and by the insertion of the name of the country at the head of each page; but these devices are not used in Part I. In some of the earlier editions the entries for the United States and Canada were numbered *seriatim* and a special index of departments of science referred to these numbers. From the present edition the index is omitted, but the numbers survive as a vestigial character.

The personal list for the United States and Canada is followed by a list of scientific societies of the same countries, with a classification by states. Being a resident of Washington, I turned, naturally, to the list for the District of Columbia, and noted at once the omission of the Washington Academy of Sciences and of nine out of the twelve scientific societies affiliated with it. Of the three affiliated societies that are listed the data for two are obsolete. The American Association for the Advancement of Science, which for seven years has had its headquarters in Washington, is still credited to Salem, the place of publication of the directory.

Despite these limitations the directory is a useful volume. It contains the names of about 18,500 scientists, with information as to addresses and specialties, and the greater part of the information is correct.

G. K. GILBERT.

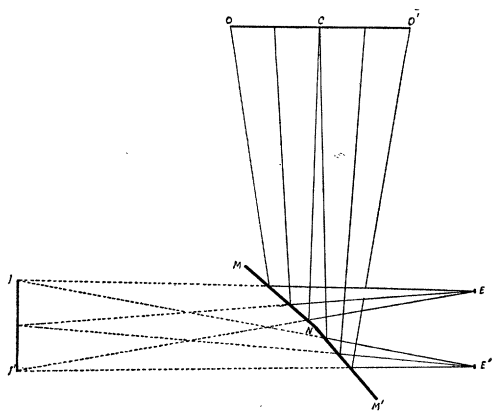
AN OVERLOOKED FORM OF STEREOSCOPE.

IN SCIENCE of November 18, 1904, Professor Jastrow describes, under the above heading, an ingenious modification of the mirror stereoscope, permitting the use of the ordinary stereoscopic card.

The arrangement described below, serving the same purpose, appears to possess some advantages. It is quite possible that this form may have been suggested before, but it has not come under my notice.

In all arrangements of this kind it is of

advantage to bring the mirrors as near to the eyes as possible, as was done in Sir Charles Wheatstone's original arrangement. If we think of the mirrors, as we may from an optical standpoint, as simple openings through



OCO' is the stereoscopic card. MN and NM' are the two mirrors. II' are the superimposed images of OC and CO', and E, E', are the positions of the two eyes.

which we see the image, it is evident that the eye gains much in freedom of position and largeness of field, if it is brought near to the mirror, precisely as we go close to a window if we desire a more extended view. Also, since the edge dividing the mirrors is thus brought between the eyes, rather than in front of them, it is no longer seen, or at least is no longer troublesome, as it is to some extent when the mirrors are farther from the eyes. Indeed, the mirrors need not meet at all nor need they be of any regular shape.

With this arrangement two views may be combined which are considerably wider than those used in the ordinary stereoscope. I have found no difficulty with drawings six inches wide. The height of an object which can be successfully used is limited by the condition discussed below. But with views of the ordinary dimensions this stereoscope is entirely satisfactory in its performance, possesses a considerable range of adjustment, and is convenient for laboratory experiment, as it is easily and quickly put together with two bits of mirror and a little wax.

All forms of reflecting stereoscope using a single stereoscopic card have this imperfection in common, that the images formed by the two mirrors do not coincide, but intersect at a considerable angle. The images of any object formed by two mirrors lie, as is well known, on the circumference of a circle, the center of which is at the junction of the mirrors, and the images are separated by an angle equal to twice the angle between the mirrors. Since the relations between object and image are reciprocal, it is plain that if the images of two objects are to be superposed by means of mirrors, forming one image, the objects must lie on the circumference of the circle, and at the angular distance occupied by the images in the previous case.

If this condition is not fulfilled, but the objects are in the same plane, as when they are on the same card, the images, while nearly superposed, will intersect at an angle equal to twice the angle between the mirrors. In my stereoscope, as commonly used, the angle between the mirrors is about two and one half degrees, so that the images form an angle with each other of five degrees. The images are over three inches wide. If their planes intersect at the median line, the edges to the right and left are separated in the direction of the line of sight by more than an eighth of an inch. This is hardly noticeable across the breadth of the view, where the line of sight is nearly perpendicular to the intersecting edge of the mirrors, but becomes so near the top and bottom, where the slight deficiency in sharpness of the horizontal lines is easily traceable to their inclination. If the center of the card is pushed back so that the card forms an arc, approximately that of the circle on which the views should lie, the improvement in definition is strikingly evident.

It is an interesting illustration of the ease with which the eye is satisfied in such matters, that the stereoscopic result is excellent over the whole view, hardly failing at all even at the extreme edges, though formed by two images so disadvantageously placed.

Frank P. Whitman.
Western Reserve University,
Cleveland, Ohio.